The Atoms in Our Bodies

Of the 100 or so atoms in the periodic table, only about 20 are proven to have an identified useful function in our bodies. They are given in the following table with an indication of their purpose:

Element	mass %	Purpose
Oxygen	65	Water; energy storage (sugars, carbohydrates, and fats)
Carbon	18	Part of all biological molecules
Hydrogen	10	Water; part of all biological molecules
Nitrogen	3	Nucleotides; amino acids (polypeptides, enzymes, proteins)
Calcium	1.4	Bones (hydroxylapatite); communication (calmodulin)
Phosphorus	1.1	DNA backbone; energy currency (ATP, NADP)
Potassium	0.25	Electrolyte balance; nerve function
Sulfur	0.25	Cysteine and methionine amino acids; coenzymes (biotin, thiamine)
Sodium	0.15	Electrolyte balance; nerve function
Chlorine	0.15	In an enzyme that catalyzes ATP to ADP (chloride-transporting ATPase)
Magnesium	0.05	In numerous enzymes that manipulate phosphate in ATP, DNA, and RNA
Iron	0.006	Oxygen carrier in hemoglobin; mitochondrial energy production (cytochromes)
Fluorine	0.0037	Hardens teeth
Zinc	0.0032	Stabilizes certain protein folds
Copper	0.0001	In certain proteins and enzymes that process oxygen
Selenium	0.000019	Processing of thyroid hormones; removal of peroxides
Manganese	0.000017	Essential to an anti-oxidant mitochondrial protein
Iodine	0.000016	Thyroid hormones (thyroxine, triiodothyronine) performing regulatory functions
Molybdenum	0.000013	Used to manipulate oxygen in some enzymes
Cobalt	0.0000021	Vitamin B_{12} (cobalamin) for blood formation and nerve function

Nutritional diseases result if a person's diet is missing any of these elements (except F) or any of the essential amino acids or vitamins.

Heavy metal toxicity results when any of the body's Fe, Cu, Mn, Zn, Co, Mo are replaced by an inappropriate element like Pb, Hg or Cd, so that the molecules of which they are a part can no longer perform their functions effectively. Heavy metals can also insinuate themselves in the amino acids that use S or Se, and thereby damage enzymes and proteins made from those amino acids.

Carbon monoxide poisoning results in hemoglobin no longer being able to carry oxygen.

Cyanide poisoning disables an enzyme in mitochondria responsible for generating energy from oxygen.

Arsenic interferes with an enzyme pyruvate dehydrogenase crucial to energy production in cells. As a result, cells with arsenic poisoning self-destruct. Particularly toxic is AsO_3 sometimes found in drinking water.

Organic toxins, like snake venoms, are typically enzymes that disrupt the normal chemical pathways in our bodies.

Radioactive fallout from nuclear fission contains $^{137}_{55}Cs_{82}$, $^{131}_{53}I_{78}$, and $^{90}_{38}Sr_{52}$ which can enter the body, and replace the normal K, I, and Ca. When they decay, they damage their surroundings.

$^{226}_{88}Ra_{138}$ from the natural decay chain of $^{238}_{92}U_{146}$ can replace the Ca in our bodies and then damage its surroundings when it decays.

$^{222}_{86}Rn_{136}$ from the decay of $^{226}_{88}Ra_{138}$ is a heavy inert gas that causes damage once inhaled. It often collects in cellars.